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# Bilateral Catheterization, Perpendicular or Parallel, to Femoral Nerve Block in Five Patients Undergoing Bilateral Simultaneous Total Knee Arthroplasty

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## Introduction

Continuous femoral nerve block (CFNB) provides good analgesia after total knee arthroplasty (TKA) [1]. There are 3 methods to catheterization for ultrasound-guided nerve block [2]: insertion in the short axis in-plane (perpendicular to the nerve), insertion in the short axis out-of-plane, and insertion in the long axis in-plane (parallel to the nerve).

In the short axis in-plane method, visualization of the nerve is easy; therefore, the time needed for catheter insertion can be shortened [3]. However, the catheter can be accidentally dislodged after placement.

In the long axis in-plane method, imaging of the nerve, needle and catheter allows real-time visualization during advancement of the catheter. Using to-and-fro movements and slight rotation of the needle's bevel, the catheter may be maneuvered under ultrasound guidance, which facilitates correct positioning.

However, advancement and final positioning of perineural catheters is difficult to visualize. We assessed the feasibility of short or long axis nerve scans for controlling perineural catheter placement in simultaneous bilateral TKA.

## Methods

We provided IRB approval of Tokyo Metropolitan Otsuka Hospital (2014-05) and written informed consent from patients. We inserted bilateral femoral perineural catheters in five patients (ultrasound-guided, needle in-plane).

We decided to place the catheter tip along the short axis on the right side femoral nerve and along the long axis on the left side. After the patients received an intrathecal injection of 20 mg of bupivacaine, bilateral femoral nerve blocks were performed under ultrasound guidance (S-Nerve, Sonosite, Japan).

The transducer was placed on the right inguinal crest and the right femoral nerve was visualized in the short axis; then, 20 ml of ropivacaine 0.375% was administered through the needle, followed by insertion of the catheter (Contiplex®, B-Braun, Germany) (Figure 1).

Left femoral nerve block was performed similarly, although the catheter was inserted in the long axis, visualized by rotation of the transducer by 90 degrees. To confirm the catheter tip, a mixture of 5 ml of 0.375% ropivacaine and 0.5 ml of air was administered through the catheter (Figure 2).

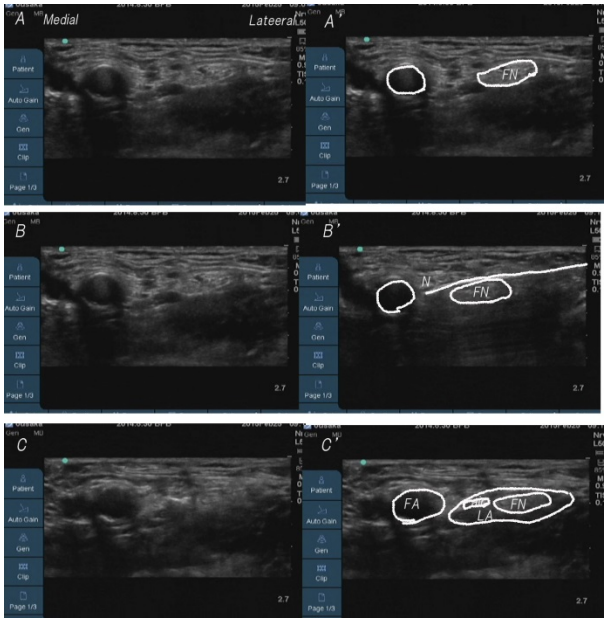


**Figure 1:** The transducer was placed on the right inguinal crest and the right femoral nerve was visualized in the short axis. B; Local analgesic was injected. C; The catheter was placed and a mixture of 5 ml of 0.375% ropivacaine and 0.5 ml of air was administered through the catheter.

We used t-tests to compare the averages of the time of the catheter insertion between two techniques. The threshold for significance was $P<0.05$. All statistical analyses were conducted using Microsoft Excel 2013.

## Results

Patient characteristics are shown in Table 1. The catheters were captured on both scans in all 5 patients. The time of catheter insertion was shorter in the short-axis group (right side: 4.6 ± 1.1 min) than in the long-axis group (left side: 9.6 ± 1.5 min) ($P<0.05$).

There was no case of failed catheter insertion. There were no significant differences in the pain scores or maximal degree of knee flexion between the right and left legs.

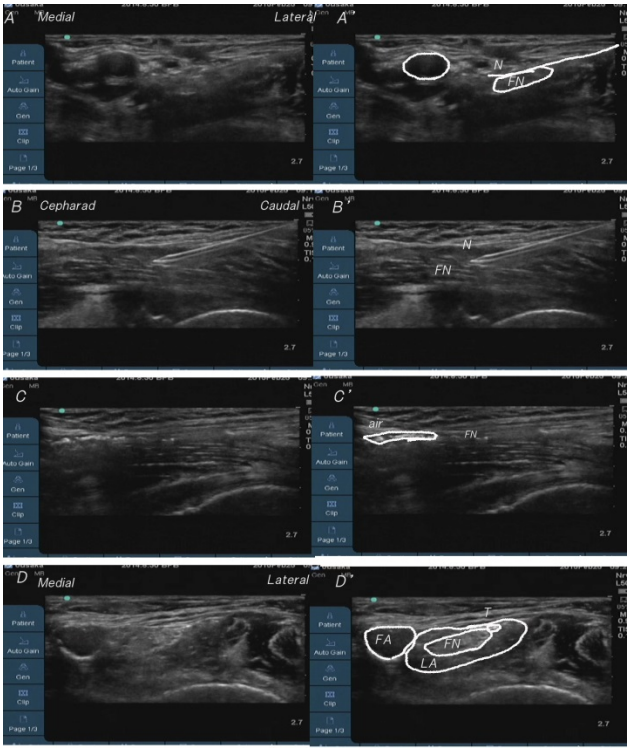


**Figure 2:** Left femoral nerve block was performed similarly, B,C; although the catheter was inserted in the long axis, visualized by rotation of the transducer by 90 degrees. D; to confirm the catheter tip, a mixture of 5 ml of 0.375% ropivacaine and 0.5 ml of air was administered through the catheter.

| **Patient characteristics** | | | | | |
|---|---|---|---|---|---|
| Patient number | 1 | 2 | 3 | 4 | 5 |
| Age | 78 | 74 | 75 | 80 | 66 |
| Sex | F | M | M | F | F |
| Height (cm) | 152 | 167 | 170 | 162 | 148 |
| Weight (kg) | 61 | 72 | 82 | 72 | 44 |
| **Postoperative pain NRS Right/Left** | | | | | |
| 1hour | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 |
| 3hour | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 |
| 6hour | 0/0 | 0/0 | 0/0 | 0/0 | 2/2 |
| 12hour | 1/1 | 1/1 | 0/0 | 1/1 | 2/2 |
| 24hour | 1/2 | 3/3 | 0/0 | 1/1 | 0/0 |
| 48hour | 2/2 | 4/4 | 0/0 | 2/2 | 1/1 |
| **ROM (range of motion) at 7 postoperative day (degree)** | | | | | |
| Right | 120 | 130 | 110 | 110 | 80 |
| Left | 110 | 130 | 110 | 125 | 80 |
| **ROM at Discharge** | | | | | |
| Right | 115 | 110 | 110 | 110 | 135 |
| Left | 110 | 120 | 120 | 120 | 130 |

**Table 1:** Patient characteristics.

## Discussion

Five patients systematically inserted catheters along the short axis on one side and along the long axis on the contralateral side for bilateral knee arthroplasty. In bilateral CFNB performed by the in-plane technique under ultrasound guidance, catheterization perpendicular (short axis) or parallel (long axis) to the nerve provides a similar quality of analgesia.

The problems of the short axis technique are that the catheter tip may bypass the target nerve given the perpendicular orientation of the needle and nerve and it is sometimes difficult to thread past the tip of the placement needle and the catheter had been accidentally dislodged after placement [2,4].

On the other hand, in the long axis technique keeping three structures-the needle, nerve, and catheter-in the ultrasound plane is not only very difficult to learn, but difficult to execute even after mastery and demonstrating the difficulties of this approach [2,3]. In our study the time of catheter insertion was shorter in the short-axis group than in the long-axis group.

## Conclusions

In bilateral CFNB performed by the in-plane technique under ultrasound guidance, catheterization perpendicular (short axis) or parallel (long axis) to the nerve provides a similar quality of analgesia after total knee arthroplasty.

## References

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